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OCCURRENCE OF THE LEAF CURL DISEASE OF TOBACCO IN THE PHILIPPINES [1]

M. O. San Juan

WITH TWO TEXT FIGURES

The leaf curl disease of tobacco (*Nicotiana tabacum* L.), a virus disease known to be transmitted by whiteflies (*Bemisia*), was observed for the first time on February 22, 1958, on Virginia tobacco plants at the Department of Agronomy, College of Agriculture and Central Experiment Station at Los Baños, Laguna.

On February 22, 1958, Virginia tobacco plants growing near the Department of Agronomy, College of Agriculture and Central Experiment Station at Los Baños, Laguna, were noted to be infected with the leaf curl disease. The tobacco plants of the variety Golden Harvest, a filler-type of Virginia tobacco, were infected with the disease to the extent of 10 per cent (fig. 1).

Leaf curl disease has not been reported before in the Philippines. The presence of a large number of naturally infected plants is probably due to the build-up of the virus titer on previous tobacco plantings in the field, or to the presence of large numbers of whiteflies during the growing season. The disease has been reported also by Hopkins (1956)[2] from the Tanganyika Territory, Africa, where the leaf curl is known as "kroesblaar," and the virus transmitted by various species of whiteflies of the genus *Bemisia*. Bawden (1950)[3] reported *Bemisia gossypiperda* M. and L. as the vector of the leaf curl disease of tobacco.

A survey of the occurrence of leaf curl disease in different tobacco regions of the Philippines has been started. Experiments on the transmission and control of the disease are in progress at the Department of Plant Pathology.

Symptoms. The leaf curl disease of tobacco is easily noticeable at a distance (fig. 1). The plants become unthrifty in growth and

[1] Central Experiment Station Contribution No. 1967.

[2] J. C. F. Hopkins. Tobacco Diseases. The Commonwealth Mycological Institute, Kew Surrey, England. 178 p. 1956.

[3] F. C. Bawden. Plant Viruses and Virus Diseases. Chronica Botanica Co. Waltham, Mass., U.S.A. 335 p. 1950.

Fig. 1.—Virginia tobacco plants in the field showing at right the natural infection of the leaf curl disease. (*Photograph taken by the Photographic Division.*)

are stunted. Very early infection of the newly transplanted seedlings renders the plants practically useless. Plants infected later in the growing season produce normal leaves at first, but the subsequent foliage produced after infection show the downward bending of the lamina.

Aside from being stunted infected tobacco plants become bunchy in appearance owing to the production of diseased leaves which show the characteristic pronounced puckering. Both edges of the leaf bend downward (fig. 2) resulting in the curling or savoying of the leaves.

A closer examination of the nether surface of the curled leaf shows that the main and secondary veins are slightly swollen or thickened. This condition makes the leaf brittle. The enlarged veins become irregularly curved giving the leaf a crinkled appearance.

In addition to the crinkling or savoying, leaves become reduced in size as infection advances. In severe cases of the disease they may be twisted or the leaf lamina even suppressed in growth (fig. 2).

Fig. 2.—Leaf samples from the diseased plants. Note the savoying on both leaves and the misshapen and irregularly-veined leaf at the right. (*Photograph taken by the Photographic Division.*)

NOTES ON DISEASES OF ORCHIDS IN THE PHILIPPINES [1]

VICTORIA M. ELA [2]

WITH FOUR TEXT FIGURES

The diseases of ornamental plants in the Philippines offer a very interesting field for study. Ornamental plants like vegetable, fruit, and field crops are subject to non-parasitic and parasitic diseases. Many diseases do occur, but information about them is unknown in most cases. Except for foreign publications, there is no up-to-date book or bulletin which deals with diseases of some of this group of plants. The diseases of orchids listed in this paper with brief descriptions of the symptoms, causes, and control were studied in the Department of Plant Pathology, College of Agriculture, University of the Philippines, at Los Baños, Laguna, from 1950 to 1957.

1. BACTERIAL SOFT ROT

A diseased specimen of Mariposa orchid (*Phalaenopsis aphrodite* Ames) collected from Los Baños, Laguna, on June 26, 1957 was submitted for identification by Mr. Delfin B. Lapis. The organism was isolated and the pathogenicity of the pure culture of the organism tested.

Dapo tigre (*Phalaenopsis schilleriana* Reich.) and *Phalaenopsis aphrodite* were successfully inoculated. The disease, although of rare occurrence, is very destructive and characterized by rapid spread. It kills the whole leaf in four or five days after inoculation.

The disease had been reported in Japan on the same host by Matsumoto and Okabe (1931). *Cymbidium aloifolium* and *C. insigne* were also successfully inoculated.

The soft rot was also reported on a species of *Cattleya* by Limber and Friedman (1943). The writer observed the disease on the latter host on July 3, 1956.

The same disease was reported by Ark (1950) and Ark and Starr (1951) in California.

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[1] Central Experiment Station Contribution No. 1968.

[2] The author acknowledges the help of Mr. Generoso M. Manzanilla, laboratory technician in plant pathology, during the course of the work.

Symptoms. The disease starts as a small water-soaked spot on the leaf blade. This increases in size very fast and is usually accompanied by foul odor (fig. 1). The infected part becomes sunken, very soft, and brownish. If not noticed on time it may work downward and destroy the whole plant.

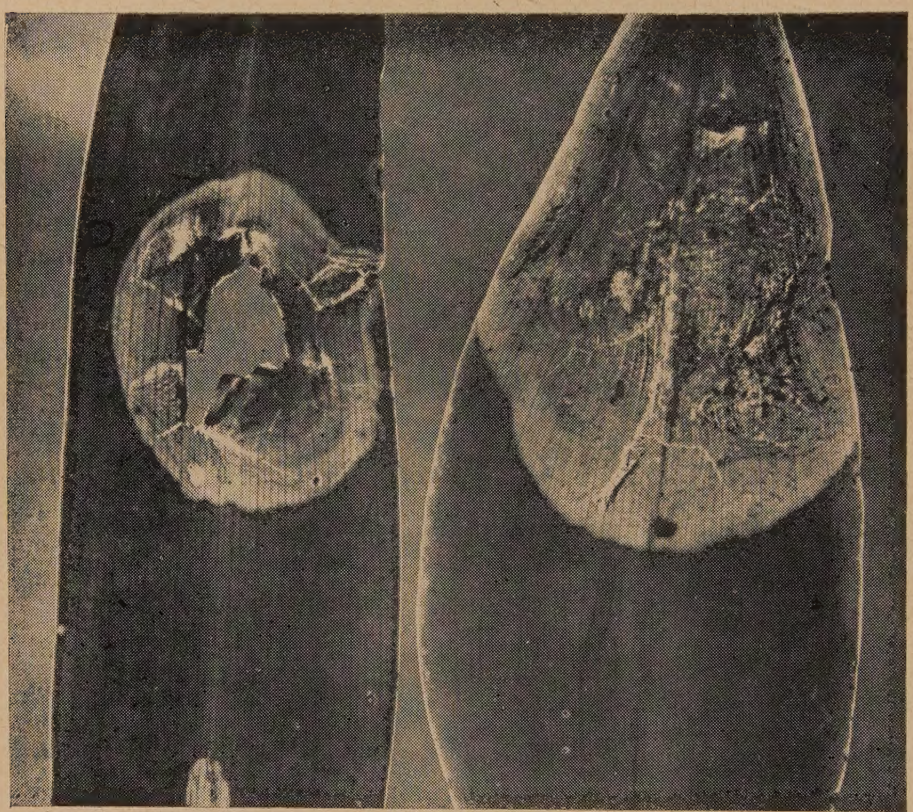

Fig. 1.—Infected leaves of *Phalaenopsis aphrodite* and *Phalaenopsis schilleriana*, respectively, showing the soft rotted tissues resulting from the infection by the soft rot bacterium. (*Photograph taken by the Photographic Division.*)

Etiology. The disease is caused by the peritrichous bacterium, *Erwinia carotovora* (Jones) Holland. It enters through bruises, injuries, or insect wounds. Abundant moisture on the surface of the tissue where the wounds are present favors penetration and infection by the bacterium.

Control. Avoid bruising or wounding the plant parts as these afford avenues for entrance of the organism. Keep the surface of

the leaves dry to check rapid development of the bacterium. Remove and burn the infected leaf and disinfect the cut surface with 1:1000 mercuric chloride solution.

2. SCLEROTIUM DISEASE, OR BASAL ROT

Specimens of diseased *Spathoglottis plicata* were submitted by Mrs. Mercedes A. Uichanco on May 5, 1950 and Mr. Gil G. Divinagracia on October 5, 1955; Grandiflora orchid was submitted by Mrs. Antonio Tan on April 6, 1951; Waling-Waling (*Vanda Sanderiana*) and *Cattleya* sp. by Dean Leopoldo B. Uichanco on July 24, 1951, and September 20, 1951, respectively. All of these specimens had Sclerotium disease. This disease, like the bacterial soft rot, is of rare occurrence but it is destructive.

Symptoms. The infected plants show rotting at the base of the root collar or base of the stem. White mycelium and later white to brown spherical sclerotia are produced on the diseased part. The leaves become pale, lose turgidity, and finally wilt. The stem of the plant turns water-soaked and finally rot. The hard stem of the flower turns brown or reddish brown, then shrinks slightly or becomes girdled, and finally becomes dry. The flowers turn yellow and wilt.

Etiology. The disease is caused by *Sclerotium rolfsii* Sacc., the sclerotial stage of *Pellicularia rolfsii* (Curzi) West. This is a very common soil-inhabiting facultative parasite attacking many plants both wild and cultivated including ornamentals. At the advent of rainy season it causes damping-off of seedlings of many vegetables and other plants, blights of young shoots, wilts and rots of stems and roots, and even rots of fruits which might come in contact with the soil that it infests.

White fungous growth and sclerotia develop on the affected surface when the humidity is high. The sclerotia are round or spherical-shaped, smooth, white when young and light yellow and brown to dark brown when mature. In culture they appear from 7 to 8 days. They are bigger in culture than on the host plant.

The fungus is inactive during the dry weather during which infection is seldom detected. The sclerotial bodies could remain in the soil for a long time. They could also float on the surface of the water. This fact may be responsible for bringing the fungus to orchids during watering or it may be introduced with the potting material.

Control. Once the fungus is detected in pot or in the garden soil, the most practical method would be early removal of the sclerotia and mycelium without injuring the plant. The plant may be immersed in one per cent copper sulfate (blue vitriol) or dusted around the stem with Fermate and replanted in pot with potting material free of pathogen or previously sterilized by dipping in hot water (60°C) for fifteen minutes.

If the disease escapes detection and the plant becomes badly infected, complete removal of the plant and potting material and use of sterilized pot and potting material will prevent occurrence of the disease.

3. PHYTOPHTHORA ROT, BLACK ROT

The disease was first observed by Ocfemia (1924) on the leaf of *Phalaenopsis aphrodite* which was collected from Los Baños, Laguna.

Specimens of diseased leaves of *Phalaenopsis amabilis* were submitted by Mrs. Mercedes A. Uichanco on October 5, 1950, and of *Cattleya* imported from Honolulu by Dean Leopoldo B. Uichanco on December 19, 1955. Dr. D. L. Umali of the Agronomy Department also submitted potted Singapore orchid affected with black rot (fig. 2). Infected leaf placed in a damp chamber produces white,

Fig. 2.—Singapore orchid showing black rot due to *Phytophthora palmivora Butler.* (*Photograph taken by the Photographic Division.*)

cottony fungous growth characteristic of a Phycomycete. Microscopic examinations revealed hyphae and spores of a species of *Phytophthora*.

Symptoms. The disease manifests itself in the form of small oval or circular water-soaked area. This enlarges, becomes yellowish and turns brown to black. When it begins from the lower end of the leaf the upper end becomes yellowish. The disease spreads rapidly under moist condition.

Cause. The disease is caused by *Phytophthora palmivora* Butl. Successful inoculation work was obtained. The fungus produces typical non-septate, granular, hyaline hyphae, globose terminal and intercalary chlamydospores and pear-shaped and globose conidia. No oospores are produced.

Control. Cut down and burn infected leaves. Separate and remove the infected plant to prevent the spread of the disease. Alvarez-Garcia (1951), who worked on the black rot of *Cattleya* spp. caused by *Pythium ultimum* Trow, recommended spraying with Parzate and Dithane Z-78 (2 pounds in 100 gallons water) or with Bordeaux mixture (2-3-50) and Copper A compound (2 pounds in 100 gallons) every other week.

4. ANTHRACNOSE

The specimen was submitted by Mrs. Mercedes A. Uichanco on April 6, 1953. The disease is of common occurrence especially on butterfly orchids or *Phalaenopsis* spp. which receive noonday sun. They become affected with sunscald and on the lesions the fungus develops.

Symptoms. The disease manifests itself in the form of brown spot. This increases in size and becomes black. It is more or less circular and somewhat sunken. Placed in a damp chamber, pinkish to black fruiting bodies (acervuli of the fungus) are produced on the lesions. These bear the spores of the fungus. In severe cases of infection, the leaves become yellow and dry.

Cause. In some cases, setae or stiff, black, bristle-like hairs are present in the spore-bearing bodies (acervuli) suggesting that the fungus is a species of *Colletotrichum*. The conidia are crescent-shaped. In other cases, there are no setae in the acervuli. The fungus is a species of *Glososporium*. The spores are oblong in shape. *Collecotrichum* and *Gloeosporium* are imperfect stages of *Glomerella cingulata* (Stonem.) S. and V. S.

Control. Remove and burn infected leaves, then spray the plant with Bordeaux mixture or other copper fungicides.

Phalaenopsis spp. should be placed where they will receive only the morning but not the noonday sun.

5. BACTERIAL BROWN ROT

Specimens of *Cattleya sp.* (figs. 3 and 4) affected with bacterial brown rot were submitted by Mr. Reynaldo Rodriguez of the Agronomy Department on October 27, 1955 and Dean Leopoldo B. Uichanco on June 26, 1956.

Fig. 3.—Cattleya plant in bloom. Leaves show infection with bacterial brown rot. (*Photograph taken by the Photographic Division.*)

Microscopic examinations revealed the presence of abundant bacterial cells. The bacterium was easily isolated. The causal bacterium is probably similar to, if not identical with *Pseudomonas cattleyae* (Pavarino) Savulescu (= *Bacterium cattleyae* Pavarino) which was identified on a similar disease of *Phalaenopsis amabilis*, *Cattleya* spp., vanilla and other species of orchid. As in other orchid diseases infected leaves may be removed and destroyed by burning. Infected plants should likewise be destroyed.

Fig. 4.—Cattleya orchid infected with the bacterial brown rot (*Photograph taken by the Photographic Division.*)

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CARCASS VALUES OF RABBITS [1]

VALENTE VILLEGAS [2]

The economic value of rabbits has spurred interest in rabbit raising. Rabbit meat can supplement the meat supply available to the people. Rabbits are in demand as laboratory animals for vaccine production and for various tests in medicine. Tanned skin of rabbits can be made into handbags and other domestic articles.

This investigation was made to determine the liveweight of butcher stock of rabbits, their dressed weight, the weight of lean and bone, dressing percentage and the weight of the different organs of the viscera, blood and skin. The work was carried out in the Department of Animal Husbandry from March 12, 1954 to October 1, 1955.

MATERIALS

Thirty-six head of adult rabbits raised in the Department of Animal Husbandry were used in this study. Six of these were native, six from Japan, six of New Zealand breed, five Californian-Japanese crossbreeds and thirteen grades of the three foreign breeds. Twenty-two were males and fourteen were females.

The rabbits were kept in hutches provided with meshed wire flooring to allow the excreta to drop below. They were fed a mixture composed of 60 parts by weight of copra meal, 25 parts fine rice bran, 8 parts corn meal, 5 parts fish meal, 1 part salt and 1 part ground shell. Soilage of either camocamotehan (*Ipomea triloba* L. and *Merremia vitifolia* Hallier) or *Centrosema pubescens* Benth. was provided in a separate receptacle at all times.

For slaughtering, each rabbit was placed on its side on the edge of a table. The point of the knife was passed through the recess between the neck and head. The blood vessels were cut close to the neck to kill the animal and to let the blood flow freely into a receptacle. The animal was then hung on a gambrel with the hind legs spread wide apart. Skinning was started on the line from the anus

[1] Central Experiment Station Contribution No. 1969.

[2] Assistance rendered by Messrs. Jacinto Gallardo, Jose Natividad and Jorge Garcia is gratefully acknowledged.

to the neck. From the circle made above each hock, the skin was cut inside to the midline. Similar circles were made above the dewclaws of the forelegs from which lines were cut to connect with the midline. When the skinning was completed, the skin was weighed.

The belly was opened slowly and carefully. The rectum was severed at the anus, which was tied to prevent ejection of the solid excreta. After the diaphragm was cut around the viscera, all the internal organs, including the omentum and ruffle fat, were removed. The stomach and intestines were emptied and cleaned; the heart, lungs, kidneys, spleen were separated and weighed. The lean was separated from the bones, and both the lean and the bones were weighed.

RESULTS

The data obtained on the various parts of the carcass are presented in tables 1 and 2. The average dressing percentage of rabbits (56.8) is less than that of pigs at the lechon stage (74.3).

* * *

Science, conscious of its purpose, can in the long run, become a major force in social change . . . But science, unaware of its social significance, becomes a helpless tool in the hands of forces driving it away from the directions of social advance, and . . . destroying its very essence, the spirit of free inquiry. To make science conscious of itself and its powers it must be seen in the light of the problems of the present and of a realizable future. It is in relation to these that we have to determine the immediate functions of science.—*John Desmond Bernal*

TABLE 1.—*Liveweight, dressed weight, weight of lean, bone, blood and dressing percentage of rabbits*

BLOOD COMPOSITION	NUMBER OF ANIMALS	SEX	LIVE WEIGHT	SHED	DRESSED CARCASS					
					Weight	Lean		Bone		Dressing percentage
			kg.	*g.*	*g.*	*g.*	%	*g.*	%	
Native	6	Mixed	2.4 ±0.15	61.7 ±7.49	1,415.7	1,065.7 ±142.84	75.3	350.0 ±16.99	24.7	59.0
New Zealand	6	Mixed	3.0 ±0.22	91.7 ±8.33	1,820.7	1,352.4 ±104.53	74.3	468.3 ±38.25	25.7	60.7
Japanese	6	Males	2.8 ±0.09	61.7 ±8.33	1,529.9	1,119.9 ±67.38	73.2	410.0 ±3.08	26.8	54.6
Californian-Japanese crossbreed	5	Males	3.0 ±0.19	100.0 ±10.49	1,665.6	1,219.6 ±58.17	73.2	446.0 ±28.91	20.8	55.5
Grade	13	Mixed	2.5 ±0.16	80.8 ±5.60	1,392.1	975.9 ±74.2	70.1	416.2 ±24.09	29.9	55.7

TABLE 2.—*Mean weight of heart, liver, tongue, brain, spleen, lungs, kidneys, skin, visceral fat, and ears (without skin) in grams*

BLOOD COMPOSITION OF RABBIT	TONGUE	HEART	LIVER	BRAIN	KIDNEYS	SPLEEN	LUNGS	VISCERAL FAT	EARS W/O SKIN	SKIN
Native	7.2	6.6	59.7	8.9	13.0	1.7	9.8	13.6	21.9	351.7
	±0.77	±1.34	±3.13	±0.38	±1.21	±0.18	±0.71	±2.84	±1.94	±2.88
Japanese	8.7	7.8	75.7	9.0	16.9	1.7	13.7	18.1	33.8	456.7
New Zealand	±0.32	±0.59	±3.86	±0.49	±1.12	±0.21	±1.59	±7.61	±32.07	±50.46
Californian-Japanese	8.6	8.3	66.8	9.5	14.7	1.4	14.5	22.6	25.3	401.7
	±1.08	±0.98	±3.56	±0.25	±0.87	±0.23	±3.40	±6.57	±3.92	±2.67
crossbreed	8.4	7.5	65.8	8.9	15.2	1.6	13.0	10.6	26.7	407.5
	±0.29	±0.27	±2.01	±0.17	±0.54	±0.14	±0.91	±2.99	±1.42	±5.55
Grade	8.6	7.5	60.7	8.8	15.5	1.4	13.2	9.8	26.0	381.5
	±0.41	±0.41	±2.86	±0.57	±1.05	±0.17	±1.72	±2.49	±1.86	±32.82

EFFECT OF LIBERAL AND LIMITED FEEDING OF WHOLE MILK AND SKIMMILK ON THE GROWTH AND DEVELOPMENT OF DAIRY CALVES [1]

L. L. Clamohoy, V. G. Argañosa and O. A. Palad [2]

Calves fed liberally with whole milk only and those fed the whole milk-and-skimmilk combination did not show significant differences. However, the calves fed liberally with whole milk made better gains in weight and body measurements than calves fed with liberal amounts of whole milk combined with skimmilk. They also consumed less amounts of milk and concentrate, had shorter feeding period and nibbled on grains earlier.

Likewise, the calves fed with limited amounts of whole milk did better than those fed with limited amount of whole milk combined with skimmilk.

The carabao calves fed liberally with whole milk were better than those fed with a limited amount. They gained on the average, 133.8 kilos in weight, 31.6 cm. in height and 54.9 cm. in heart girth. On the other hand, calves fed with limited amount of whole milk gained only 50.3 kilos in weight, 19.7 cm. in height and 29.8 cm. in heart girth. However, group I animals consumed, on the average, 1,054.4 kg. milk and 80.1 kg. concentrate; group II calves consumed only 432.9 kg. whole milk and 41.2 kg. concentrate. The carabao calves fed liberally with whole milk had a longer feeding period than the calves fed with limited amount.

Artificial raising of calves gives the dairyman more milk from his nursing cows and hence more financial returns as a result of regulating the amount fed to the calves. When the cream is separated from the milk, as in the case where butter is made, the skimmilk is available for calf feeding. Furthermore, profits from dairying depend on economical methods of raising calves which often require the use of systems based on limited milk feeding.

When the calves can be raised on rations with limited milk, then more milk will be available for human consumption. This is especially important when there is a shortage of milk or other nutrients for the human diet.

This study was conducted in the Department of Animal Husbandry, College of Agriculture and Central Experiment Station from

[1] Central Experiment Station Contribution No. 1970. Research Project No. 931.

[2] The authors acknowledge the help of Drs. K. L. Turk, J. K. Loosli and Prof. R. W. Spalding, Cornell visiting professors in the College of Agriculture, U.P.

December, 1954 to March, 1957 to determine whether calves can be raised on limited amounts of milk and on milk from which the butterfat has been either entirely or partially removed.

Groenewald (1935) suggested that a 3 to 5 per cent butterfat in milk facilitates an easier and more desirable passage through the digestive tract than does skimmilk. The useful rule he followed was to give each calf approximately one pound of milk daily for every 10 pounds of calf weight. Whole milk feeding was extended over a three-week period. Changes for increases and decreases in milk fed were made at the rate of one-half pound every second day until the calf was three weeks old.

Murley and associates (1950) claimed maximum growth can be obtained when liberal amounts of whole milk and separated milk are fed. Whole milk was fed their calves for 3 to 4 weeks and then replaced gradually by separated milk. Skimmilk feeding was continued for 3 months or until calves were 4 months old.

Turk and Burke (1949) stated that in feeding milk the amount should not exceed 10 per cent of the body weight of the calf daily. A suggested daily feeding schedule for a dairy calf worked out by them is shown in table 1.

TABLE 1.—*Whole milk and skimmilk feeding schedule*

AGE OF CALF	AYRSHIRE, BROWN SWISS AND HOLSTEIN		GUERNSEY AND JERSEY	
	Whole milk lbs.	Skimmilk lbs.	Whole milk lbs.	Skimmilk lbs.
1 to 3 days	With cow		With cow	
4 to 7 days	8		5	
Second week	9		6	
Third week	10 to 0	0 to 10	7 to 0	0 to 7
Fourth week		10 to 12		8 to 9
Fifth week		12 to 14		10 to 12
Sixth to 16 weeks		14 to 16		12 to 14

Yapp and Nevens (1955) give the following directions when skimmilk is not available and whole milk must be used sparingly: (1) Feed calves liberally at start. (2) Encourage calves to eat other feed. During this period use every effort to encourage the calves to eat grain mixtures and legume hay in large amounts. (3) Follow definite schedules of feeding.

They also recommend substitution of skimmilk for whole milk when calves are about three weeks old. Calves that are below normal in size or vigor should receive whole milk somewhat longer.

They cited further that extensive calf-feeding trials at the University of Illinois showed that calves must have milk until they are at least 60 days of age. Even after 60 days, some calves in the experiment greatly benefited by feeding milk for a longer period. In no case was it found possible to discontinue milk feeding at 60 days of age unless the calf had been accustomed to eating liberal amounts of hay and grain mixture.

MATERIALS AND METHODS

Twenty-six dairy calves born to the College herd were used in experiment 1 and fourteen carabao calves in experiment 2. The calves were confined individually in pens at the calf barn. Each pen was properly lighted and ventilated and provided with bedding, feed, and water troughs.

The calves were allowed to stay with their respective dams for the first three days from birth for colostrum feeding. After the first three days they were separated from their dams and pail-fed twice daily at the time the herd was milked.

From the fourth day until the third week, all the calves were given whole milk. Later, one group was shifted gradually to separate milk at the rate of one-half kilogram every feeding.

The composition of the concentrate mixture given to the calves as soon as they were separated from their dams is shown in table 2. Water was made available to each calf in petroleum cans.

TABLE 2.—*Composition of concentrate mixture*

INGREDIENT	WEIGHT	TOTAL D.P.[a]
	kg.	*kg.*
Copra meal	63.93	9.269
Ground yellow corn	17.05	1.313
Fine rice bran	17.05	1.279
Mineral mixture	.98	
Common table salt	.98	
Total	99.99	11.861

[a] Based on Morrison's Feeding standard.

The calves were confined in their respective pens most of the time except during weighing until they were four months old when they were allowed daily into pasture lots for green roughage, sunshine and exercise.

Enough whole milk was separated by using a de Laval cream separator so that sufficient amount of skimmilk was available for each feeding.

Initial weights were based on weighings made on the third, fourth, and fifth day from birth and the final weights on the average of the last three consecutive days. Weights at seven-day intervals were taken during the experiment.

The same procedure followed in weighing was applied in the measurements of height and heart girth of the animals.

Observations and measurements were taken until the calves were six months old or until they were fed no more milk.

Experiment 1

Schedule 1. The details of this schedule are given in table 3. The amount of milk and/or skimmilk was equivalent to 10 per cent of the body weight of the animals adjusted weekly.

TABLE 3.—*Liberal feeding of whole milk and whole milk and skimmilk combination*

AGE	DAILY ALLOWANCE (kg.)	
	Group I (Whole Milk)	Group II (Whole Milk and Skimmilk)
1–3 days	With dam	With dam
4–7 days	10% of initial weight	Whole milk, 10% of initial weight
Second week	10% of 1st week weight	Whole milk, 10% of 1st week weight
Third week	10% of 2nd week weight	Whole milk, 10% of 2nd week weight
Fourth week	10% of 3rd week weight	Whole milk and skimmilk changed at the rate of 0.5 kg. per day, 10% of 3rd week weight
Fifth week	10% of 4th week weight	Skimmilk, 10% of 4th week weight
Sixth week	10% of 5th week weight	Skimmilk, 10% of 5th week weight
	(Stop 10% after this week)	
Seventh week: The calf is milk-fed until it attains the 60-kg. limit. This may be attained earlier or later than the 6th week, in which case milk feeding may be correspondingly shortened or prolonged. The 6.0–kg. of milk, equivalent to 10% of the 60–kg. body weight, is maintained for one month; then decreased by 2 kg. per week until milk is entirely withheld.		

Schedule 2. Table 3a shows the amount of whole milk and whole milk and skimmilk combination given to calves daily.

TABLE 3a.—*Limited feeding of whole milk and whole milk and skimmilk combination*

AGE	DAILY ALLOWANCE (kg.)	
	Group III (Whole Milk)	Group IV (Whole Milk and Skimmilk)
1–3 days	With dam	With dam
4–7 days	2.2	2.2 whole milk
Second week	2.4	2.4 " "
Third week	2.6	2.6 " "
Fourth week	2.8	2.8 whole and skimmilk changed at the rate of 0.5 kg. per day
Fifth week	3.0	3.0
Sixth week	3.2	3.2
Seventh week	3.4	3.4
Eighth week	3.6	3.6
Ninth week	3.2	3.2
Tenth week	2.8	2.8
Eleventh week	2.4	2.4
Twelfth week	2.0	2.0
Thirteenth week	1.6	1.6
Fourteenth week	1.2	1.2
Fifteenth week	.8	.8
Sixteenth week	.4	.4

Experiment 2

Group I. Liberal feeding of whole milk. Individual animals were fed whole milk equivalent to 10 per cent of their body weight adjusted weekly until they attained the 100-kg. weight. Thereafter, feeding was prolonged for one month and gradually decreased by a kilogram of milk weekly until no more milk was allowed the animal.

Group II. Limited feeding of whole milk. Individual animals were fed milk equivalent to 7 per cent of their body weight adjusted weekly until they attained the 50-kg. weight. Thereafter, feeding was maintained for one week and gradually decreased by a kilogram of milk weekly until no more milk was allowed the animal.

The following are the chemical analyses of the milk and skimmilk (from Holstein-Red Sindhi cows) used for feeding:

COMPOSITION	WHOLE MILK %	SKIMMILK %
Moisture	87.54	90.63
Crude protein	2.71	2.80
Crude fat	3.40	0.00
Ash	0.68	0.62

RESULTS AND DISCUSSION

Protein requirements. Table 4 shows the digestible protein required for growing dairy calves and the actual amount of digestible protein from the milk and concentrates, respectively, that the animals were able to obtain from the limited amount of milk in experiment 1, schedule 2.

TABLE 4.—*Digestible protein requirement for dairy calves*

AGE	LIMITED FEEDING (kg.)					
	From Morrison's Feeding Standard		Experiment, Schedule 2			
			Group III Whole milk		Group IV—Whole milk and skimmilk	
	Weight of animals	Digestible protein requirement	Weight of animals	Digestible protein requirement	Weight of animals	Digestible protein requirement
Initial			25.0		27.0	
First week			24.4		27.1	
Second week	27.3	0.091–0.114	27.2	0.076	28.1	0.078
Third week			27.5		30.4	
First month			28.2		31.8	
Second month			40.2		41.0	
Third month	45.5	0.136–0.181	48.8	0.113	46.6	0.149
Fourth month			61.4		61.2	

With the chemical analysis of whole milk showing 2.71 per cent crude protein and skimmilk, 2.80 per cent (digestibility according to Morrison for whole milk being 3.3 per cent and skimmilk 3.4 per cent) the amount of digestible protein that the animals got from the milk and concentrates fed was approximately equal to the amounts considered as liberal requirements by Morrison for growing dairy calves.

Weight and body measurements

Experiment 1. In schedule 1, the average gain in weight of the whole milk-fed group (group I) for the entire period was 98.3 kg. and for the skimmilk-fed group (group II), 96.7 kg. or a difference of 1.6 kg. The average gain in height of the animals in group I was 30.6 cm. and in group II, 31.2 or a difference of 0.6 cm. In heart girth, group I animals increased by 42.4 cm. and group II, 44.9 cm. or a difference of 2.5 cm.

In schedule 2, the average gains of the whole milk-fed group (group III) were 35.7 kg. in weight; 14.7 cm. in height, and 21.7 cm. in heart girth. The skimmilk-fed group (group IV) gained 34.2 kg. in weight, 13.2 cm. in height and 17.5 cm. in heart girth. The

differences, all in favor of group III animals were 1.5 kg. in weight, 1.5 cm. in height and 4.2 cm. in heart girth.

These results agree with the findings of Otis as cited by Petersen (1950), that calves fed on skimmilk did not make quite large daily gains as those receiving whole milk.

However, the analysis of variance showed that these differences in gain between the groups were statistically insignificant. Skimmilk may then be considered a good substitute for whole milk at the age of four weeks for growing dairy calves. Changes in the amount of skimmilk must be gradual to prevent digestive trouble.

Experiment 2. In this experiment for carabao calves, the liberal milk-fed group (group 1) made an average gain in weight of 133.8 kg.; in height, 31.6 cm. and in heart girth, 54.9 cm. The carabao calves (group II) fed with limited amount of whole milk, made an average gain of 50.3 kg. in weight, 19.7 cm. in height and 29.8 cm. in heart girth. The differences, all in favor of group I animals, were 83.5 kg. in weight, 11.9 cm. in height and 25.1 cm. in heart girth. The differences in gains in weight and body measurements of the carabao calves in both groups were statistically significant. This finding showed that carabao calves can not be raised economically on limited amount of whole milk (tables 5, 6, and 7).

Length of feeding.

Experiment 1. The average length of feeding the calves in group I was 182.1 days and for group II, 197.1 days or a difference of 15.0 days. This showed that the animals fed whole milk required

TABLE 5.—*Gain in weight of animals in experiment 2*

GROUP I		GROUP II	
Herd No.	Gain	Herd No.	Gain
	(*kg.*)		(*kg.*)
139	183.9	144	59.9
140	121.3	145	53.5
141	106.0	149	42.0
143	120.0	151	53.1
25	140.0	154	20.5
56	151.5	58	60.0
57	114.0	62	63.9
Mean	133.8	Mean	50.3

SMD (L) 5% = 25.38
1% = 35.59

TABLE 6.—*Increase in height of animals in experiment 2*

GROUP I		GROUP II	
Herd No.	Height	Herd No.	Height
	(*cm.*)		(*cm.*)
139	30.9	144	33.9
140	32.4	145	18.3
141	29.6	149	14.7
143	34.2	151	14.0
25	35.1	154	12.0
56	35.0	58	20.6
57	24.0	62	24.7
Mean	31.6	Mean	19.7

SMD (L) 5% = 7.04
1% = 9.87

TABLE 7.—*Increase in heart girth of animals in experiment 2*

GROUP I		GROUP II	
Herd No.	Heart girth	Herd No.	Heart girth
	(*cm.*)		(*cm.*)
139	64.7	144	32.8
140	61.2	145	29.6
141	51.2	149	23.3
143	51.9	151	22.0
25	53.1	54	26.0
56	57.4	58	34.4
57	45.3	62	40.2
Mean	54.9	Mean	29.8

SMD (L) 5% = 7.62
1% = 10.69

shorter time to attain 60.0 kg. live weight. This difference was however, insignificant.

The animals under the limited feeding schedule had the same length of feeding period.

Experiment 2. For the carabao calves, the average length of feeding days required for the liberal milk-fed group was 187.0 days and the limited milk-fed group, 136.3 days or a difference of 50.7 days. The analysis of variance showed this difference to be statistically significant (table 8).

Milk and concentrate consumption

Experiment 1. Table 9 shows that group I animals consumed the total amount of 689.3 kg. milk and 119.6 kg. concentrate on the

TABLE 8.—*Length of feeding days of animals in experiment 2*

GROUP I		GROUP II	
Herd No.	Length of feeding (*days*)	Herd No.	Length of feeding (*days*)
139	182	144	126
140	184	145	122
141	184	149	134
143	208	151	108
25	182	154	157
56	185	58	143
57	184	62	164
Mean	187.0	Mean	136.3

SMD (L) 5% = 18.02
1% = 25.26

TABLE 9.—*Results of the effect of liberal and limited whole milk and skimmilk feeding to dairy calves and liberal and limited whole milk feeding to carabao calves*

	EXPERIMENT 1				EXPERIMENT 2	
	Schedule 1		Schedule 2			
	Group I	Group II	Group III	Group IV	Group I	Group II
Number of animals used	8	8	5	5	7	7
Average weight, kg.						
Final	120.6	119.8	60.8	61.2	167.4	89.1
Initial	22.3	23.1	25.1	27.0	33.3	38.8
Gain	98.3	96.7	35.7	34.2	133.8	50.3
Average height, cm.						
Final	93.2	95.0	80.1	80.9	101.1	88.6
Initial	62.6	63.8	65.5	67.7	69.5	68.9
Gain	30.6	31.2	14.7	13.2	31.6	19.7
Average heart girth, cm.						
Final	104.6	106.5	87.2	85.6	128.5	102.6
Initial	62.2	61.6	65.5	68.1	73.6	72.9
Gain	42.4	44.9	21.7	17.5	54.9	29.8
Av. length of feeding, days	182.1	197.1	120.0	120.0	187.0	136.3
Av. milk consumed, kg.	689.3	720.6	263.2	263.2	1054.4	432.9
Av. concentrates consumed, kgm.	119.6 [a]	151.2 [a]	41.7	51.2	80.1	41.2
Av. age to nibble grains, days	30.6	33.5	17.2	19.0	63.2	48.9

[a] Complete data for only six animals from each group.

average. Group II animals had an average milk consumption of 720.6 kg. and 151.2 kg. concentrate. The group II calves consumed

31.3 kg. more milk and 31.6 kg. more concentrates than the whole milk-fed group.

In schedule 2, the total milk consumption were the same. However, the whole milk-fed group consumed an average of 41.7 kg. concentrates and the other group, 51.2 kg. or a difference of 9.5 kg.

The differences between groups in experiment 1 were statistically insignificant.

Experiment 2. The average amount consumed by group I was 1054.4 kg. milk and 80.1 kg. concentrates; group II, 432.9 kg. milk and 41.2 kg. concentrates. Group I animals consumed 621.5 kg. more milk and 38.9 kg. more concentrates.

Analysis of variance showed these differences to be statistically significant (tables 10 and 11).

TABLE 10.—*Milk consumption of animals in experiment 2*

GROUP I		GROUP II	
Herd No.	Consumption	Herd No.	Consumption
	(*kg.*)		(*kg.*)
139	1088.9	144	375.3
140	1085.4	145	408.2
141	846.4	149	410.7
143	1200.1	151	392.7
25	890.9	154	528.8
56	1210.3	58	459.3
57	1040.6	62	455.4
Mean	1054.4	Mean	432.9

SMD (L) 5% = 119.84
1% = 168.02

TABLE 11.—*Concentrate consumption of animals in experiment 2*

GROUP I		GROUP II	
Herd No.	Consumption	Herd No.	Consumption
	(*kg.*)		(*kg.*)
139	61.9	144	33.6
140	65.8	145	44.3
141	73.8	149	16.3
143	89.2	151	26.8
25	42.4	154	62.3
56	109.1	58	40.4
57	118.8	62	64.4
Mean	80.1	Mean	41.2

SMD (L) 5% = 26.67
1% = 37.39

Age to nibble grains. In experiment 1, group 1 calves were 30.6 days old on the average when they started to nibble grains and 33.5 days for group II or a difference of 2.9 days.

In schedule 2, group III calves nibbled for the first time when they were 17.2 days old on the average and group IV, 19.0 days old or a difference of 1.8 days.

In experiment 2 for carabao calves, the liberal milk-fed group were on the average 63.2 days old when they started to nibble on concentrates and the limited milk-fed group 48.9 days old or a difference of 14.3 days.

The differences between groups in all feeding schedules were statistically insignificant.

It could be shown clearly that when the calves lacked the necessary amount of milk to satisfy bulk they were forced to start earlier in life to take in concentrates.

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SOCIO-ECONOMIC CONDITIONS OF NARRA SETTLERS IN SAN PEDRO TUNASAN, LAGUNA [1]

Ernesto P. Abarientos

One hundred twenty-seven settler families were interviewed in the two areas of the San Pedro Tunasan settlement; 102 in San Vicente and 25 in San Antonio. Ninety-six per cent of the farm operators in San Antonio and 84 per cent in San Vicente were farmers before they came to the settlement.

More than half of the farms were less than 3.5 hectares. Only a little over two-thirds of the farms were under cultivation. Palay, one of the major crops, had an average yield of only 17 cavans per hectare, and was produced mainly for home consumption. As a single crop, it gave the lowest gross annual returns (₱112 per hectare). The vegetable enterprise, when followed by other crops, had the highest gross annual returns per hectare, ₱328.

The NARRA provided the settlers with work carabaos, swine, and chicken on credit. More than half of the tools and equipment owned by the settlers interviewed were supplied by the NARRA on the same basis. The total farm loan, including the value of land, amounted to almost ₱1,000 per settler family to be paid on installment basis, without interest, for ten years. The first payment will start after the third year of settlement. Inadequate supply of drinking water, as well as lack of irrigation facilities, was considered the most important problem of the settlers. They were also bothered by the peace and order problems in the settlement.

Land settlement is one of the approaches of the Philippine government to its program of land reform. To implement this objective, the National Land Settlement Administration (NLSA) was created by law on June 3, 1939. This agency was responsible for the development of the Koronadal valley in Mindanao. Soon after, the Rice and Corn Production Administration (RCPA) superseded the NLSA. The failure of the RCPA, however, led to the creation of the Land Settlement and Development Corporation (LASEDECO). In 1954, the LASEDECO was abolished. The National Resettlement and Rehabilitation Administration (NARRA) was organized then to carry out the function of the defunct agencies.

[1] Central Experiment Station Contribution No. 1971. Thesis presented for graduation with the degree of Bachelor of Science in Agriculture from the College of Agriculture, November, 1957. Prepared in the Department of Agricultural Economics under the direction of Mr. Pedro R. Sandoval.

As of September 30, 1956, the NARRA project reservations totalled 621,857 hectares, of which 449,145 were arable. There were 19,655 settler families.

The San Pedro Tunasan settlement is one of these NARRA settlement projects. Information on the set-up of this settlement and its settlers will be helpful in the evaluation of the program, and may be used by policy-makers and program administrators. Furthermore, it will be useful as an "eye opener" to prospective settlers.

So far there have been only two attempts to study guided land settlement. The first study was made by Velmonte [2] and the other by the Division of Agricultural Economics of the DANR.[3]

Sandoval [4] conducted a third study, but this was concentrated on unguided land settlement which was not concerned with any NARRA project.

THE SETTLEMENT

San Pedro Tunasan settlement was formerly a friar land owned by the *Colegio de San Jose* and was once a part of the San Pedro Tunasan estate of San Pedro, Laguna. The whole settlement comprising an area of 850 hectares was purchased by the government through the NARRA in 1954 and was opened for settlement in May, 1955.

The settlement is divided into two parts by a private lot. One part called the San Antonio Area [5] has an area of 206 hectares and is about one kilometer from the town of San Pedro; and other part, the San Vicente Area [6] where the townsite [7] has been established, has an area of 600 hectares and is about seven kilometers from the town. There were 403 settler families, 104 in San Antonio and 299 in San Vicente. Settler families in the townsite were each provided with a home lot. However, only those with farm lots in San Vicente availed themselves of the home lots, probably because the settlers in San Antonio are nearer the town and find it more convenient to dwell in the town than in the townsite.

Both areas of the settlement are accessible by roads. A road passing through San Antonio connects the townsite to the town, and

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[2] J. E. Velmonte, *The Philippine Agriculturist*, **30**, 239 (1941).
[3] Socio-economic conditions of the settlers in the government settlement project in Tinambac, Camarines Sur. *FEAP Newsletter, 1:* 16-17 (1956).
[4] Pedro R. Sandoval, *The Philippine Agriculturist*, **40**, 498 (1957).
[5] Here 25 settler families were interviewed on January, 1957.
[6] Here 102 settler families were interviewed in December, 1956.
[7] Refers to the central area where the settlers are clustered.

another nearing completion leads directly from the town to San Vicente. Transportation facilities are very limited. Only two salvaged army weapons carriers and one or two jeepneys commute from the town to the townsite at the time of the survey. Vehicular transportation is possible only during dry months.

The settlement has two seasons: the dry season, from January to April, and the wet season, from May to December. The topography, especially in San Vicente, is about 15 per cent level and 85 per cent rolling. The soil is clay to clay loam.[8]

The San Pedro Tunasan settlement is an example of the government's policy of providing land to the landless through the expropriation of landed estates. The purchased estate was subdivided and resold to the original occupants of the land who were provided with such inducements and privileges as dwelling, work animals, and farm implements. However, the settlers of this settlement received no subsistence from the NARRA.

THE FARM OPERATORS

Occupation prior to settlement. Farming was the main occupation of most farm operators prior to settlement. In San Vicente about 84 per cent of the farm operators were farmers. Only about four per cent reported no former occupation. Others who reported working as firewood gatherers, carpenters, farm laborers, wage earners, restaurant owners, students, painters, *calesa* drivers, shoemakers, and bakers, represented 14 per cent of the total number of operators interviewed in the area.

All operators in San Antonio were gainfully employed prior to settlement. Almost all or 96 per cent were farmers. Others were engaged in other minor occupations such as carpentry and baking.

In both areas some operators reported having more than one occupation.

Age and education. Farm operators in San Vicente were on the average six years younger than those in San Antonio.

The farm operators in both areas had a low level of education. In San Vicente, the farm operators had an average of 2.6 years of schooling and those in San Antonio, 3.8 years (table 1).

[8] Information supplied by the Agricultural Development Office, NARRA, Manila.

TABLE 1.—*Characteristics of farm operators*

ITEM	SAN VICENTE	SAN ANTONIO	ALL FARMS
Number of farmers	102	25	127
		Average	
Age of farmers	37	43	38
Years of schooling	2.6	3.8	2.8
Size of farmer's household	5	5	5
Use of farmer's time			
Months worked on farm:			
In settlement	7.2	6.6	7.1
Outside settlement	.8	1.0	.8
Months worked off farm	1.0	1.6	1.1
Months not gainfully employed	3.0	2.8	3.0

Only about 9 per cent of the farm operators had high school and college education. About 32 per cent had no formal education; 46 per cent went to primary schools and 13 per cent to intermediate schools.

Size of operator's household. A household had an average of 5 members. The operator's household was composed of individuals who lived on the operator's income.

Use of operator's time. 1. Months worked on farm. The settlers in both areas averaged about 8 months on farms within and without the settlement. Farm operators in San Vicente spent an average of one-half month more in the settlement than farm operators in San Antonio (table 1). However, the San Antonio settlers spent more time working outside the settlement than the settlers in San Vicente. This may be attributed to the small size of farms in San Antonio and possibly to the nearness of the farms to the town.

2. Months worked off farm. The farm operator's off-farm work averaged one month in San Vicente and one and one-half months in San Antonio. The proximity to the town enabled the San Antonio farmers to spend more time on off-farm occupations. However, only 1 out of 3 settlers in San Antonio had off-farm occupation. This seems to indicate limited employment opportunities for off-farm work in the locality. Income from off-farm work averaged

₱206 in both areas. The annual income from off-farm work on the average was higher for operators in San Antonio than for those in San Vicente. Two settlers in San Antonio had regular non-farm employment. One was a government employee with a yearly income of ₱1680; the other, a factory worker with a yearly income of ₱2496.

TABLE 2.—*Income of operators from off-farm work*

OFF-FARM WORK [a]	AVERAGE INCOME PER YEAR		
	SAN VICENTE	SAN ANTONIO	ALL FARMS
Number of operators reporting	33	6	39
		Pesos	
Firewood gatherer	47	—	47
Farm laborer	70	—	70
Cochero	247	30	193
Carpenter	255	525	390
Others	435	1452 [b]	1045
All operators	104	906	206

[a] Income of 4 per cent of the operators could not be ascertained because they harvested on farms outside the settlement.

[b] One a government employee and the other a factory worker.

3. Months not gainfully employed. For about 3 months of the year, the settlers were not gainfully employed. A recent study showed that a farmer in the Philippines was not gainfully employed for an average of 4.6 [9] months.

THE SETTLEMENT FARMS

Size of farms. The original plans of the NARRA called for the subdivision of the settlement into 3-hectare farms. All the former occupants of the place wanted a share in the settlement. To accommodate the applicants the settlement had to be subdivided into smaller units. Farms in San Vicente averaged 2.3 hectares and those in San Antonio, 1.2 hectares (table 3). For both areas, 93 per cent of the farms did not exceed 3.5 hectares. Sixty per cent of the San Antonio farms were 1.5 hectares and less.

[9] Horst von Oppenfeld, *et al.*, Central Exper. Sta. Bull. 1, U. P. Central Experiment Station, College, Laguna, August (1957).

TABLE 3.—*Size of farm*

SIZE OF FARM (HA.)	SAN VICENTE	SAN ANTONIO	ALL FARMS
Average size	2.3	1.2	2.1
	Per cent distribution		
0.5 & less	3	8	4
0.6–1.5	26	52	32
1.6–2.5	39	28	37
2.6–3.5	23	12	20
3.6–4.5	6	0	5
4.6 & above	3	0	2
Total	100	100	100

Land use. About two-thirds of the total farm area was under cultivation (table 4). On San Vicente about 1.4 hectares or 64 per cent of the total farm area, and in San Antonio about 0.9 hectare or 77 per cent were cultivated.

TABLE 4.—*Land utilization*

LAND USE	AVERAGE SIZE (HA.)		
	San Vicente	San Antonio	All farms
Cultivated	1.4	1.0	1.3
Noncultivated	0.8	0.3	0.7
Farmstead	[b]	[a]	[b]
Total farm area	2.2	1.3	2.0
		Per cent	
Cultivated	64	77	65
Noncultivated	35	23	35
Farmstead	[c]	[a]	[c]
Total	100	100	100

[a] No settler had a farmstead in the townsite.
[b] .05 hectare, or less.
[c] Less than 0.5 per cent.

Each farm in the two areas less than a hectare was planted to palay but this represented the greater part of the settlement under cultivation. Seventy-two per cent of the farms in San Vicente and more than 50 per cent of those in San Antonio were devoted to palay (table 5). Some portions of the land were planted to vegetables, fruit trees and others.

TABLE 5.—*Utilization of cultivated area*

LAND USE	AVERAGE SIZE (HA.)		
	San Vicente	San Antonio	All farms
Palay	1.0	0.5	0.9
Fruit trees	0.2	0.3	0.2
Vegetable	0.1	0.1	0.1
Others [a]	0.1	[b]	0.1
Total cultivated area	1.4	0.9	1.3
		Per cent	
Palay	72	56	69
Fruit trees	14	33	15
Vegetable	7	11	8
Others [a]	7	[c]	8
Total	100	100	100

[a] Banana, cassava, coconut, corn and peanut.
[b] .05 hectare.
[c] Less than .05 per cent.

Type of farming. More than one-half of the farms in the settlement were palay farms (table 6). The type of farming was classified on the basis of contribution of each crop to the gross farm receipts. Any two single crops that contributed not more than 66 per cent of gross receipts but each contributing not more than 50 per cent were classified as combination. Two-thirds of the farms in San Vicente and about one-fourth in San Antonio were classified as palay farms (table 6). More than one-third of the farms in San Antonio were devoted to vegetable production.

TABLE 6.—*Type of farming* [a]

TYPE OF FARMING	SAN VICENTE	SAN ANTONIO	ALL FARMS
Number of farms	98	23	121
		Per cent	
Palay	67	26	59
Vegetable	28	35	29
Fruit trees	2	22	6
Mungo	1	—	1
Combination	2	17	5
Total	100	100	100

[a] Four of the settler's farms in San Vicente and two in San Antonio had not been cultivated since the NARRA settlement.

While most farms were planted to two or three different crops, there was a tendency to specialize in only one. The degree of specialization is reflected in the percentage of gross farm receipts derived from the major crop enterprise (table 7). All major crops except mungo contributed about two-thirds or more of the gross farm receipts. Fruit farms had the highest degree of specialization for both areas as a whole.

TABLE 7.—*Per cent of gross receipts derived from major crop by type of farming*

TYPE OF FARMING	San Vicente	San Antonio	All farms
Number of farms	98	23	121
	Per cent of gross receipts derived from major crops		
Palay	87	68	85
Fruits	77	97	91
Vegetable	74	75	74
Mungo	51	—	51
Combination	68	79	76

Land-use intensity. Although only 15 per cent of the farms in the whole settlement had double-cropping on palay, these farms showed a very high rate of double-cropping and/or intercropping (table 8). However, the extensive use of the land in the area as a whole can be attributed partly to the recent opening of the settlement. At the time of the study, the settlement was only in its second year of operation.

TABLE 8.—*Extent of double-and/or intercropping by type of farming*

AREA AND TYPE OF FARMING	PER CENT OF TOTAL NUMBER OF FARMS	PER CENT OF DOUBLE-AND/OR INTERCROPPING
San Vicente:		
Palay	15	102
Vegetable	1	50
Mungo	1	37
San Antonio:		
Palay	16	97
Vegetable	4	50
All farms:		
Palay	15	101
Vegetable	2	50
Mungo	1	37

Palay yield and disposition of produce. The yield of palay per hectare was very low. Both areas reported only about 17 cavans to a hectare. This could be attributed to the improper farm practices. The rice seeds planted were often low-yielding or non-standard varieties. Some settlers reported that the palay seeds they acquired from NARRA had very low percentage of germination and that this resulted in a very poor stand of the plants. Erosion in some of the fields resulted in the removal of the more fertile top soil.

Receipts from sales of crop. About two-thirds of the farms in San Vicente and almost all of those in San Antonio made sales from their crops (table 9). The sales, however, were low. Palay could have augmented the crop sales but yield was low. Besides, this staple was produced mainly for home consumption.

TABLE 9.—*Receipts from sale of crops*

AREA	FARMS REPORTING SALES	AVERAGE AMOUNT OF SALES
	Per cent	*Pesos*
San Vicente	68	116
San Antonio	92	165
All farms	72	128

Land values and gross returns. The NARRA had set a uniform land value of ₱250 per hectare. Therefore, unlike in previous farm management studies, land values in this study did not reflect the real market value of the land or the value judgment of the settlers. This land valuation, which seemed to have been made arbitrarily by the NARRA, is quite low when compared to the land values, which ranged from ₱322 to ₱5,721 per hectare, as found in a recent farm management and tenancy study.[10]

Palay as a single crop gave the lowest gross annual returns of ₱112 per hectare (table 10). The returns increased when followed by other crops. Von Oppenfeld and associates [11] reported a gross annual return of ₱245 for palay as a single crop and ₱319 when followed by other crops.

The vegetable enterprise, when followed by other crops, had the highest annual gross returns (₱328). Fruit trees interplanted with other crops gave ₱301. However, the relative profitableness of the different enterprises was not ascertained.

[10] *Ibid.*
[11] *Ibid.*

TABLE 10.—*Annual gross return per hectare of 122 settlers' farms*

ITEM	NUMBER OF FARMS	GROSS RETURNS PER HECTARE IN PESOS
Palay farming:		
Palay only	33	112
Palay followed by another crop	62	194
All palay farms	95	164
Vegetable farming:		
Vegetable only	11	292
Vegetable followed by another crop	6	328
All vegetable farms	17	314
Fruit farming:		
Fruit trees only	5	168
Fruit trees interplanted with crops	5	301
All fruit farms	10	260
All farms	122	180

Rice farming in the settlement was subsistence in nature. Farmers could not raise enough palay for sale especially in San Antonio. Almost all the produce from vegetables and fruit trees were sold to local merchants. About one-third of other crops like corn, peanut, and banana were consumed at home (table 11).

TABLE 11.—*Disposition of farm produce*

MANNER OF DISPOSITION	PALAY	VEGETABLES	FRUITS	OTHERS
San Vicente:				
Sold	16	88	92	72
Personal use	83	12	8	28
Farm quantity [a]	1	—	—	—
San Antonio:				
Sold	—	95	89	67
Personal use	96	5	11	33
Farm quantity	4	—	—	—
All farms:				
Sold	14	89	89	70
Personal use	85	11	11	30
Farm quantity	1	—	—	—

[a] Negligible for all farms for vegetables, fruits and other crops.

Tools and equipment. The most common tools of the settlers were plows and bolos (table 12). Ninety-three per cent of the farms

in San Vicente and 76 per cent of those in San Antonio had plows and an average of two bolos each. Other tools and equipment included harrows, sleds, mattocks picks, spades, hoes, weeding tools, harvest tools and others.

TABLE 12.—*Tools and equipment of settlers* [a]

TOOLS AND EQUIPMENT	PER CENT OF TOTAL FARM REPORTING			AVERAGE NUMBER PER FARM REPORTING		
	San Vicente	San Antonio	All farms	San Vicente	San Antonio	All farms
Plow	93	76	90	1.3	1.6	1.3
Harrow	21	48	26	1.0	1.2	1.1
Sled	69	24	60	1.0	1.0	1.0
Bolo	92	92	92	1.5	1.7	1.5
Mattock pick	50	68	54	1.5	1.3	1.5
Spade	28	24	28	1.2	1.3	1.2
Hoe	49	56	50	1.1	1.4	1.1
Halabas	51	24	46	1.0	1.2	1.1
Harvest tools	77	84	70	1.6	1.7	1.6
Others [b]	11	32	15	1.0	1.2	1.1

[a] Includes those tools and equipment given by NARRA.
[b] Rakes, carpenter tools, iron bars, and *caritelas*.

Plows, bolos, mattock picks, spades and hoes were supplied by the NARRA on credit. Plows were the most common implement given to the settlers (table 13). Most farmers in San Antonio had their own tools and equipment.

TABLE 13.—*Tools and equipment supplied by NARRA* [a]

TOOLS AND EQUIPMENT	TOTAL NUMBER		AVERAGE NUMBER PER FARM REPORTING	
	San Vicente	All farms	San Vicente	All farms [b]
Plow	87	91	1.1	1.0
Bolo	34	34	1	1
Mattock pick	25	25	1	1
Spade	25	25	1	1
Hoe	38	38	1	1

[a] Supplied to settlers on credit.
[b] Includes farms reporting in San Antonio area.

Slightly more than one-half of the plows, spades and hoes owned by the settlers in the entire settlement came from the NARRA (table 14). On the other hand, bolos and mattock picks were largely provided by the settlers.

In San Vicente, 71 per cent of the plows, about 24 per cent of the bolos, 71 per cent of the spades, 72 per cent of the hoes and 46 per cent of the mattock picks were supplied by the NARRA.

TABLE 14.—*Comparison of tools and equipment owned by settlers and given by NARRA*

TOOLS AND EQUIPMENT	TOTAL NUMBER			PER CENT OF TOTAL NUMBER OF TOOLS AND EQUIPMENT		
	Owned by settlers	Given by NARRA	Total	Owned by settlers	Given by NARRA	Total
Plow	62	91	153	41	59	100
Bolo	146	34	180	81	19	100
Mattock pick	51	25	76	67	33	100
Spade	18	25	43	42	58	100
Hoe	35	38	73	48	52	100

Livestock and poultry. The carabao was the only source of farm power in the settlement. Eighty-nine per cent of the farms in San Vicente and 72 per cent of those in San Antonio had carabaos (table 15). Poultry consisted mostly of chickens and ducks (table 16). Other livestock of the settlers included horses, swine, and goats.

TABLE 15.—*Farms reporting livestock and poultry*

KIND OF LIVESTOCK	NUMBER OF FARMS REPORTING		
	San Vicente	San Antonio	All farms
Total number of farms	102	25	127
Work carabao	91	18	109
Young carabao	5	4	9
Horse	5	2	7
Swine	22	10	32
Chicken	44	17	61
Other livestock [a]	1	3	4
	Per cent of total number of farms		
Work carabao	89	72	86
Young carabao	5	16	7
Horse	5	8	6
Swine	22	40	25
Chicken	43	68	48
Other livestock [a]	1	12	3

[a] Ducks and goats.

TABLE 16.—*Livestock and poultry owned by settlers at the time of survey*

KIND OF LIVESTOCK	AVERAGE NUMBER PER FARM REPORTING		
	San Vicente	San Antonio	All farms
Work carabao	1.2	1.4	1.3
Young carabao	1.6	1.2	1.4
Horse	1.0	1.0	1.0
Swine	1.6	1.4	1.6
Chicken	8.4	9.5	8.7
Others	2.0	11.0	8.7

The NARRA provided the settlers with work carabaos, swine, and chickens on credit (table 17). Murrah carabaos were also given to some settlers for improving the native stock in the settlement. These animals were loaned by the Bureau of Animal Industry to the NARRA and were not included in the accounts of the settlers. At the time of the survey only a few settlers had chickens or swine. Some of these livestock were either sold or consumed at home. Most losses in chickens were due to pests of poultry like rats and snakes.

TABLE 17.—*Livestock loaned by NARRA* [a]

KIND OF LIVESTOCK	TOTAL NUMBER OF LIVESTOCK			AVERAGE NUMBER OF LIVESTOCK PER FARM		
	San Vicente	San Antonio	All farms	San Vicente	San Antonio	All farms
Work carabao [b]	97	16	113	1.1	1.1	1.1
Swine	35	—	35	1.7	—	1.7
Chicken	495	109	604	14.7	31.4	15.9

[a] Supplied to settlers on credit.
[b] Murrah carabaos given to some settlers not included.

FINANCIAL AIDS

Aid to settlers. As in any other organized land settlement project, the NARRA provided the settlers of this settlement with their primary needs excluding subsistence. The aids were in the form of dwellings for those with farms in San Vicente, and livestock, seeds and other planting materials, and tools and equipment for both areas. Not all settlers, however, had obligations to the NARRA. Some were not able to get these aids because they were either late applicants or they already had them. Although NARRA's policy was to provide each settler with a house in the townsite of the settlement, almost all settlers in San Antonio did not have houses in the townsite, for they were nearer the town than the townsite.

Loans in the form of livestock constituted the largest item of NARRA aid, and dwelling and livestock loans constituted the next largest items (table 18). The expense for opening the individual settlements was not included in the information gathered due to a controversy which was in progress during the survey.

TABLE 18.—*Average amount of loans of settlers from the NARRA*

ITEM	NUMBER OF FARMS REPORTING			AVERAGE AMOUNT PER FARM REPORTING		
	San Vicente	San Antonio	All farms	San Vicente	San Antonio	All farms
				Pesos		
Land	102	25	127	572	305	518
Dwelling	54	—	54	250	—	250
Livestock	89	14	103	335	330	334
Crop	95	8	103	58	14	54
Tools and equipment	87	4	91	60	30	59
All farms	103	25	127	1101	499	980

Farms in San Antonio had less than half of the average amount of loan granted to settlers in San Vicente. This was because the San Antonio settlers had smaller farms and did not have loans for dwellings. These farmers had houses in town. Majority of the farmers in this area also owned most of their tools and equipment.

For all farms each operator incurred a standing loan of almost ₱1000 from the NARRA, payable without interest in ten equal yearly amortizations. Loan payments were to begin after the end of the third settlement year.

Other sources of credit were the relatives of the settlers and landlords for those farming in the lowland outside the settlement. There were no FACOMA's in the settlement during the study; otherwise, the farmers could take advantage of the liberal credit that this institution extends to farmer-members.

THE SETTLERS' HOUSEHOLD

Education of members of settler's household. San Antonio settlers could afford to send their children to school in the town where there is a complete elementary school. This accounted for the longer periods of schooling of children in the area. Only primary courses were offered in the schoolhouse in San Vicente. Consequently, most of the settlers in this part of the settlement could not send their children beyond the primary grades because of the

TABLE 19.—*Average year of schooling of members of the settler's household, 14 years old and over*

MEMBER OF FAMILY	AVERAGE YEAR OF SCHOOLING		
	San Vicente	San Antonio	All farms
Operator	2.6	3.8	2.8
Wife	2.2	3.3	2.4
Son	3.9	6.4	4.6
Daughter	4.3	6.1	5.1
Others	2.8	2.7	2.7

distance of their location from the town. Table 19 shows the average year of schooling of the members of the settler's household.

Distribution of population. Fifty-seven per cent of the settlers who were 14 years of age or more were in the labor force. Of these, 39 per cent were male, and 18 per cent, female. Of the unemployed, 14 per cent were under 65 years old and three per cent were 65 years old and over. Housewives and school children, who constituted about 43 per cent, were not included in the labor force. However, housewives did some part-time work on and off the farm.

Recreation. There were no recreational facilities in the settlement although settlers, especially those in San Vicente, found time to see the movies in town on week-ends. The public schools had not opened up reading centers during the survey. Old vernacular magazines were about the only reading materials in the settlement.

ATTITUDES AND OPINIONS OF SETTLERS

Problems and needs of settlers. There was a wide diversity of opinion regarding the problems and needs of settlers in San Vicente (table 20). The need for drinking water supply was foremost among their chief problems. An artesian well in the place was the primary source of potable water. Other sources were creeks some of which dried up during the summer.

San Vicente settlers had more problems than San Antonio settlers; hence, those of the latter are not separately mentioned in table 20. Among these problems were lack of good drinking water supply, lack of feeder roads, unproductive land, and lack of work animals. More than one-half of San Antonio settlers did not specify any problems and needs.

What the settlers could do

1. The settlers have received a liberal support from the NARRA in terms of material loans of almost ₱1,000 per settler family pay-

TABLE 20.—*Problems and needs of settlers*

PROBLEMS AND NEEDS	PER CENT OF TOTAL NUMBER OF SETTLERS RESPONDING	
	San Vicente	All farms [a]
Drinking water supply	37	33
Problem of peace and order	26	21
Poor roads	24	20
Lack of medical assistance	20	5
Lack of planting materials	14	13
Marketing of farm produce	13	10
Lack of farm implements	11	9
Lack of subsistence	10	9
Lack of credit facilities	9	7
Need of reopening school	6	5
Lack of work animals	3	3
Dwelling not complete	3	2
Lack of off-farm work	3	2
None	19	26

[a] Include farmers interviewed in San Antonio.

able without interest in ten years. Majority of our farmers do not receive such privilege. The settlers can improve themselves financially through self-help. They can supplement their farm income by performing off-farm work or working on home industries.

2. The study indicated that the settlers received better returns from vegetable farming. Extensive land cultivation was also observed in the area. The settlers can increase their income substantially with a more intensive use of their limited land resource. In addition, they could adopt improved and better farming practices under proper guidance.

3. Except as a source of staple food for home consumption, rice was not a profitable enterprise. Permanent crops seemed to be more promising in the area, although no immediate monetary returns could be expected. However, these can be interplanted to short-season crops such as vegetables which may provide them with cash income.

What the NARRA could do for the settlers

1. Farm management studies showed that farm income was closely linked with the size of business. The larger the farm, the better was the operator's chance to realize a satisfactory farm income. More than two-thirds of the farms did not exceed 2.5 hectares. To give each settler family a farm of economic size, the

NARRA would do well to resettle some of the families to some of its settlement projects.

2. It is a NARRA policy to require settlers to stay on the settlement. However, the settlers considered their water supply inadequate. There was only one artesian well for 299 settler families in San Vicente area. In addition, the peace and order situation bothered the settlers. Hence, most of the settlers stayed on in the settlement during the day and returned to town at night. Installation of additional artesian wells and the presence of a police detachment in the settlement may help solve these problems.

3. The settlers who were interviewed maintained that they did not get recommendations such as advice to meet their farming needs. Previous employees did not stay in the settlement proper. A NARRA official or an agriculturist who could perform administrative duties, if assigned full-time and who would stay in the settlement, could help the settlers with their farming problems.

1. The settlement is ideally located from the standpoint of marketing. It is about seven kilometers from the town proper of San Pedro and 31 kilometers from Manila where most of the vegetables produced in the settlement were sold.

2. The returns from the farming operations of the settlers were very low. The settlement was already in its second year of existence. With the present policy of the NARRA on loan collection, it is doubtful whether the settlers would be able to start paying their loans after the third year. Furthermore, some of the settlers had started to plant their farms to permanent crops. This would take about five to seven years before these crops would bear fruits or be ready for first harvest.

3. The primary aim of the NARRA in purchasing the estate was to solve the agrarian trouble in the area. But it was not able to implement its policy of giving 3-hectare lots to each settler family due to the numerous applicants. The farms are too small. In the long run, the agrarian problem may not be solved even when these small farm lots may be further parcellized due to the rapid growth of population.

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